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CONSIDERATIONS OF MINING IN TAPAJÓS BASIN AND IMPACTS ON MUNDURUKU LAND

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ABSTRACT

This paper aims to analyze the extent which it is possible to establish actions that lead to sustainable development, considering social and environmental conflicts issues present in the process that involves mining issue in the Tapajós River and regional infrastructure integration works promoted by IIRSA, through Programa de Aceleração do Crescimento (PAC). The study will analyze the mineral exploration issue in the Tapajós river basin and in environmental conservation areas. It will also examine how the State's role in these conflict areas is given. On the other hand, it will try to understand how this increase in mining poses a threat to the environment.

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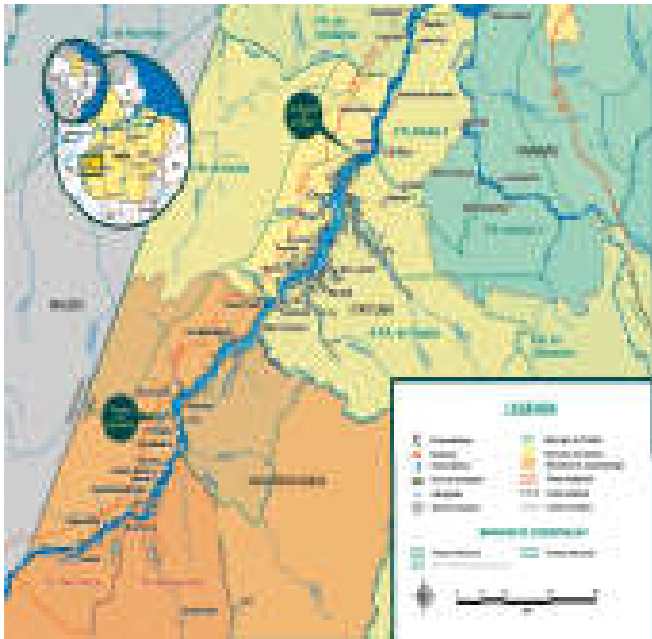
INTRODUCTION

Since the Provisional Measure of the Republic Presidency was promulgated in 558/05, of January 2012, in reference to the reduction of three conservation units, among them the Amazon National Park, and with the alteration of other protected areas limits, the mineral exploration has been causing great devastation in this region. Conservation areas will be impacted by the hydroelectric complex of Tapajós basin, since the measure reduces the Amazon National Park limits and promotes the decrease of the National Forests Itaituba I and II, the Crepuri National Forest and the Environmental Protection Area of Tapajós. In other words, it can be said that the impacts on these indigenous lands and the region will occur not only in the physical aspect but also in a large range of subfields. These subfields involve the landscape dimensions of cultural heritage, both tangible and intangible, social, as well as economic resources and other effects. Thus, the technique of content analysis was based on qualitative research for the construction of a work that is true to reality.

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It is unthinkable to conceive this research dissociated from a visit in the place, it is required by the dynamic of the environmental, cultural, political, economic and social reality of the region. The ongoing transformations in place are accelerated requiring the need for constant updating. This dynamic of facts is one of the contemporary academic world challenges. In the fieldwork (BIERI, 2015, 2017, 2018), the bricolagem method (Lévi - Strauss, 1976) that was essential to search for the information legitimation contained in this text, were recorded through aerial photographs, the environmental impacts produced by the mining enterprises in the Tapajós river, Das Tropas river and Jamanxim, as well as in the environmental conservation areas.

Mineral exploration in the Tapajós basin: the new gold cycle: The Tapajós mineral province is characterized by an expressive production of gold. In this way, it is considered as the largest gold district in the world, in an area around 100 thousand square kilometers. This is geographically limited to the north by the Amazon basin, northwest of the Itaituba city (PA). To the east, by the Iriri river. To the south, by the Serra do Cachimbo, and to the west, by the Abacaxis river (Figure 1)



Source: Sumário Executivo AAI da Bacia do Tapajós

Figure 1. Tapajós River Region Tapajós River Basin

The Tapajós Mineral Province is located politically in the municipalities of Itaituba, Jacareacanga, Novo Progresso and Trairão, in the state of Pará. According to Coutinho (2008), gold deposits are distributed in different types of rocks. This means that gold mineralization in the Tapajós represents the final term of the upper crust of Proterozoic gold, orogenic type (Mesozoic), and the predominance is alluvial gold. It is subdivided into four gold zones: the zone of Barreiras (Vila de Barreiras in Itaituba) and Riozinho do Anfrísio; Amana, Cuiu-Cuiu- Morro Grande and Parauari (Mapurá) and Baú. The Barreiras zone, located on the right bank of the Tapajós River, is characterized by gold-producing and diamond mineralization. On the other hand, the Amana, Cuiu-Cuiu and Morro Grande zones can be considered important gold-producing zones of the eastern Amazon, since in the 1980s they were responsible for over 100 tons of alluvial gold. This zone was divided into several districts, sub-districts, and communities, where there are hundreds of quarries. Of these, many are still in full swing, including large illegal mines within the Munduruku indigenous area according to Bieri (2015, 2016, 2017 and 2018 n.c).

Notable amongst others are the Igarapé do Ratinho quarries, Água Branca district, Tocantinzinho sub-district (currently Tocantinzinho Project, operated by a Canadian subsidiary), Large Mine in the Crepori National Forest (inside indigenous Munduruku land in Das Tropas river and Massaranduba river), Puerto Rico mines. The Morro Grande and Baú zones are located on the Curuá River. It is an area geologically constituted by a set of metamorphic rock formed by quartz - sericite - schist, quartzite. In addition, it is an important area of alluvial gold, composed of several quarries, grottoes and subdistrict, such as Roncador, Rosa de Maio mine, Grota Rica mine of Das Tropas river, Estirão das cobras district, Marupá, Nova Esperança, Nova Vida, Creporizinho, and others. Historically, from the eighteenth century, there have been reports of gold exploration in the Tapajós region since the Jesuits established the first population core and encouraged the Indians to metal mining (Condreau, 1897). But it was in 1958 that Nilçon Pinheiro set off on an expedition from Manaus-AM to reach the vicinity of the municipality of Jacareacanga,

where he discovered the first gold quarries of the Tapajós, called Grota Rica do Tapajós (Lestra and Nardi, 1984). According to Rodrigues (1994) and Amot (1996), this grotto was located a few kilometers upstream of Rio das Tropas, a tributary on the right bank of the Tapajós river. Along with the discovery of alluvial gold in the Das Tropas river, a large number of people migrated to the region, to the handcraft gold exploration. In this first moment, according to Leandro (1969), due to the difficulties of access, the mines settled along the most important rivers of the Tapajós basin, such as Crepori, Creporizinho, Jamanxim, Cuiu-Cuiu, and Curuá, and others. With the decline in the rubber production in the region, the current phase of mining in the Amazon was initiated (MATHIS, 1997). The opening of the Transamazônica and Cuiabá-Santarém highways facilitated the connection of Itaituba city and the financial markets. In this sense, according to MATHIS (1997), the construction of these roads also favored the colonization program of the federal government in the 1970s, attracting a large influx migrants from various regions of the country to the region. According to Rodrigues (1984), the large number of people and the increase of mines in the region caught the attention of governmental authorities, at that time. Thus, in 1972 an agreement was signed between the DNPM and the Fundação de Assistência ao Garimpeiro (FAG) so that the mining activity in the Tapajós valley could be disciplined. However, only in 1977, DNPM created a specific project for the study of Brazilian mines, with the purpose of solving socio-environmental problems in these regions.



Large mine in the Das Tropas river. (2018)

Figure 2. Holes dug by hydraulic backhoes on river banks and destroying ciliary forests

In the 1970s, however, with the isolation, there was a lack of communication, infrastructure, health care, education, and sanitation, which was typical of Amazon mines already showing the absence of the State. Nevertheless, mining activity grew in the region, and resources from this activity leveraged the disorderly growth of cities, such as Itaituba and Santarém, which controlled the distribution of goods to supply the mines. Although the Tapajós region is an unstructured frontier it stood out, from the economic point of view, mining as an important activity in the Amazon productive balance. It stands out from the beginning to the public policies absence of local development. Thus, the surrounding municipalities reproduced the social problems present in the mineral provinces of other Pará regions such as poverty and inequality. It is believed that it was from 1978 to the 1980s that mining had its apogee at this mining first phase of the Tapajós Mineral Province (Lestra and Nardi, 1984). In 1980, the Departamento Nacional de Produção Mineral- DNPM was awarded the equivalent of 400 mineral research requirements, of individuals residing in

Itaituba or Santarém. Therefore, according to Becker (2004), within the geoeconomic and territorial perspective, one of the characteristics of this process is related to the geographic extent of the region. From an environmental point of view, the effects of gold mining decades caused and cause nowadays great damage in the Tapajós province. According to Bezerra analysis (1998), the mining activity affects severely the morphology of the rivers, mainly with the execution of dredging where the rivers banks are dug, destroying the ciliary forests, and excavations in their riverbeds. (Figure 2 and Figure 3).



Large mine in the Das Tropas river. (2018)

Figure 3. Mines follow water courses, and tons of land are thrown into the water, causing silting of rivers and altering streams

Manual mining or artisanal mining is based on processes with productivity considered low to the demands of the modern market. And for methods, a variety of techniques are employed in a field for the different types of plowing. In general, the artisanal form employed in mining resembles a form of complex ritual. This rudimentary form of mining has a complete cycle, which must be followed to the letter, and that goes from the site choice to the calculations of the manual extraction costs. Suction dredging has been present in the Tapajós mining since the 1970s. In addition to the environmental cost, this method of suction has a high operating cost (Lestra and Nardi, 1984). It corresponds to 0.50 to 1.00 g of gold per m³ of gravel removed. The dredging operation begins with the descent of a diver to the river bottom. This worker will be attached to an oral breathing apparatus connected to an air compressor. It also features waterproof masks and clothing to withstand the cold during operation. The diver goes down to find the gravel that will be extracted or sucked up the pipe, upward, in a box. Afterward, this material will be analyzed by the equipment called in Portuguese as "Cobra fumando" and then verified in the gold panning. In this way, the dredger can move through the river, looking for the best places for gold extraction. However, it must be considered that the effective use of these dredging activities causes social problems, besides the contamination of the rivers. This is due to diseases caused by the residues of the elements used for purification, especially mercury and cyanide, which affect the aquatic ecosystem and Sexually Transmitted Disease. According to Farias (2002), mines also leads to socio-environmental conflicts, such as deforestation, population increase, prostitution, slave labor, and illegal firearms possession. These problems, caused by the absence and low capacity of governmental spheres intervention, in the conduct of these activities. According to the Instituto Chico Mendes de Conservação da Biodiversidade

(ICMbio), there are about 60,000 men working on more than 100 ferries, gold and diamond exploration, in the Tapajós and Jamanxim rivers basin, which characterizes this region as the largest Brazilian Mine. Other aspects that call attention is the increase in the number of airstrips, because, according to Coutinho (2008) and Monteiro (2011), there are 300 airstrips in the Tapajós, 170 in Parima and 185 in Alta Floresta. The number of backhoe loaders, according to Ibama data (December 2018), there were 66 machines active in the Das Tropas river and in the Massaranduba river within the Munduruku Indigenous Land. One of the main factors that caused this increase in mineral activities in the Itaituba II Forest and in the Amazon National Park was the Presidential Provisional Measure, MP 558/05, of January 2012. This reduced three conservation units, and among them is the National Park of the Amazon. Thus, it changed the limits of other environmental protection areas, as the Itaituba Forest II, through Decree n° 2.678 / 2012. These areas were reduced for the construction of São Luiz do Tapajós and Jatobá hydroelectric plants reservoirs. In this way, the region became the target of illegal mining activities. As it was no longer an area of environmental conservation, it became vulnerable and uncontrolled in the monitoring and recovery of these impacts generated by mining, on the part of ICMbio. It is now the direct action of the Ministério de Minas e Energia, via DNPM, the state, and local governments in order to regularize and supervise mining in the region. Another aspect that should be taken into account is the information of the interested parties on the procedures for environmental licensing, focused on the sustainability of this activity. On the other hand, historically, Brazil has never had a coherent planing with the potential of the Amazon, that is the largest tropical forest in the world and much of that territory is in Brazil. And, one of the historical difficulties presented is, precisely, in the lack of integration of the power institutions (Union, state and municipalities) in the delimitation of responsibilities between government bodies. From the political point of view, since the 1970s from the military dictatorship, through governments of various colors and flag into the present time, all have maintained the maxim for the Amazon to meet market interests in exports and production of foreign exchange for the equilibrium of trade balance.

However, the fact that the Amazon occupies a position of importance in modernity in the climatic balance of the planet, Brazil should discuss, mobilize people and coherent arguments to draw an alternative development from the environmental specificity. It is known that Amazon is a strategic region for the economic articulation of South America. However, the discussions about the sustainability of the use of natural resources, allied to development issues, are very complex. Generally, this occurs when related to the damages caused to the ecosystem and to the cultural patrimony, without bringing any benefit to society. In this context, the implementation of exogenous development policies, based on the hydroelectric construction in the Tapajós River and allied to the mining issue, have caused a predatory and disorderly occupation in this region, mainly in protected areas. In general, although these new economic dynamics of continental integration, the Amazon continues to be conceived as an unstructured frontier supplying raw material for the rest of Brazil, as well as for other countries. From ECLAC (Economic Commission for Latin America and the Caribbean) (2007) point of view, investments in South America are mainly focused on enabling access to natural resources available in this region. It is also

emphasized that in the interpretation of the entrepreneurs it is only a cost-benefit ratio, aiming the economic potentiality. From the macroeconomic point of view, the financial logic, to the detriment of the environmental preservation issue, can be observed when analyzing the unfolding of public policies in the Amazon. With regard to environmental problems, Costa (2006) clarifies that the capitalist system has a powerful regulation system, which is the market. Where the adjustments will be proportional to the fundamental variables, that is, the environmental damages resulting from these megaprojects will be treated as externalities or effects that, once recognized as environmental damages, can be corrected by the companies (COSTA apud COMUNE, 1994; ROMEIRO, 1998), at the equivalent cost to the effects that they cause.

Nowadays, the Amazon position in geopolitical space, multifaceted in the global context, is defined by its great biodiversity, by the value of its wealth, by its territorial immensity and by its strategic geographical position. It is also worth mentioning the water resources abundance, since it concentrates practically all the remaining hydroelectric potential of Brazil, besides being the largest mineral province in the world. Therefore, it is a region considered fundamental for humanity, still in the concept of the ecological heartland of the planet, by the international community. On the one hand, there is the interest of the large supranational blocs Stakeholders with regard to the massive exploitation of natural resources. On the other hand, it reveals another rationality to think of future scenarios for the Amazon as a factor of environmental, climatic balance, regional, national and global. From this perspective, is questioned the socio-cultural and environmental consequences of this situation will be for the ancestral peoples, riverine people, quilombolas and others, who will be affected by the growing occupation of these enterprises. It is necessary to emphasize the institutions' role, mainly in relation to public policies, planned for the Amazon. It is also worth noting the intervention of the Brazilian state in the face of this greater complexity situation, mainly in the evaluation of the environmental crisis caused by activities predatory to the environment. These activities, directed by the economic structure directed to consumption, which exploits nature in any way, in order to produce goods and services, with the total absence of planning, social responsibility, and prevention as to the damage caused to the biosphere. In this perspective, the climate change theme is part of the main discussion in the world. This is because the effects of these changes are being felt in various parts of the world and have attracted the global scientific community attention. In addition, the great changes in the global climate, due to the anthropic action with the environmental destruction, have their effects felt in chain, in several continents, because the universe is an interconnected system. Such effects give rise to major concerns for governments. As an example, the island's disappearance in the Pacific Ocean linked to extreme weather phenomena, cyclones such as the latest Idai that affected 3 million people in three countries Zimbabwe, Malawi and Mozambique killing at least 686 people (Data: portal G1 03/27/2019). And, conflicts, civil wars, and intergroup violence. These are situations that require co-operation between countries, especially by developed countries, in regard to climate agreements financing. Thus, in the specific case of mining in the gold province of Tapajós, it is not the fact that mining exists, by the activity itself. What is actually questioned is the absence of control mechanisms, by governments through regulatory agencies, inspection agencies,

in the case of indigenous land including FUNAI. As well as, on the social and environmental responsibility of these enterprises, which will make it possible to avoid environmental catastrophes (Figure 4 and Figure 5).



Marcia Lasmar Bieri collection

Figure 4. Das Tropas River contaminated by garbage and mercury waste, there is no aquatic life only mud



Marcia Lasmar Bieri collection

Figure 5. Absence of the garbage adequate treatment that is dumped directly into the forest soil in the mine in Das Tropas River

From this point of view, according to Elster (1982), the mining industry in the Tapajós mineral province is not dissociated from the Amazon, not even from the climate issue, drug trafficking and slave labor, in other words from illegal activities of mining, is constructed an advanced analysis of the micro fundamentals of this phenomenon. In this sense, another seminal prerogative in the process is the Presidential Provisional Measure of July 2011, which reduced three conservation units, among them the Amazon National Park. In January 2012, the Republic Presidency issued the MP 558/05, reiterating the content of the first, with the alteration of the limits of other conservation units, which will be directly impacted by the Tapajós basin's hydroelectric complex. According to Terra de Direitos (2014), this new measure further reduces the limits of the Amazon National Park and promotes the decrease in the Itaituba I and II National Forests, in addition to the Crepuri National Forest and the Tapajós Environmental Protection Area.

Mineral legislation versus environmental legislation: what is the role of the Brazilian Government?

The Government and its organs are fundamental elements for control, through a series of measures to regulate and intervene

in crises, aimed at the balance of social and environmental basis. In Brazil, the mineral question is subject to a set of formal rules, since the three governmental spheres have responsibilities, in relation to mineral activities and the environment. The Federal Mining Law N° 7.805 of July 18, 1989, regulates the mining activities, and for this, it is mandatory to have the prior environmental license, which must be provided by the competent environmental agency and is valid for two years. It can also be said that Brazilian environmental legislation is modern and the National Environmental Policy was created from the Federal Constitution of 1988. However, the Constitution makes no reference to the environmental licensing process, but the National Environment Policy adopts environmental licensing as one of its procedures. Thus, environmental licensing is the main government instrument in the environment defense. Effectively, it is an administrative process in which the competent body, whether statewide or municipal, will decide on the grant of the aforementioned license.

In regard to the guidelines and regulations definition, it should be noticed that the main line of action for consolidation is at the federal level. As an example, there is the practice of issuing concessions and enforcing compliance with mineral and environmental legislation. In this sense, the Ministério do Meio Ambiente (MMA) is the institution responsible for formulating and coordinating environmental policies. Both reformulations and the coordination of such policies takes place through the organs connected to the ministry. These bodies would be the Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA), as well as the Instituto Chico Mendes de Biodiversidade (ICMbio). Conselho Nacional de Meio Ambiente (CONAMA) is responsible for these policies formulating, whose resolutions have normative powers, according to Gonçalves and Lira (2009), provided that the legislative branch has not approved specific legislation. The CONAMA's Resolution, 237/97, in art. 1o provides for the requirement of environmental licensing for activities considered as the environment polluters, which may cause environmental degradation, which is the case of mining activities. In contrast, the implementation of the Estudo Prévio de Impacto Ambiental (EIA) is required for the environmental licensing of any activities that use the natural resource and is defined by CONAMA Resolution, n° 1/86. However, Farias (2002) clarifies that the EIA must be embodied in the RIMA, which is the Relatório de Impacto Ambiental. In addition, it must be submitted to the state environmental agency for analysis and approval. Thus, after the approval of the EIA / RIMA does the project obtain the Environmental License (EL), to operationalize its activities.

Regarding the environmental licensing, the chief engineer of the Departamento Nacional de Produção Mineral (DNPM) / Itaituba, Odair Lamarque, in an interview with a newspaper about mining (BARROS, 2015), explains that 98% of the mining in the region are illegal. This is due to the fact that they perform the mining activity without the environmental license. This practice is characterized as a crime, capable of suspending the activity, in addition to being responsible for the environmental damage caused. However, according to DNPM / Itaituba, environmental licensing is carried out through the Secretaria de Estado de Meio Ambiente (SEMMA), in Belém. In this sense, there is a need to move stakeholders to the state capital. And, according to the DNPM (2015), are these stakeholders who will have to pay the commuting of SEMMA

technicians costs up to the mineral activity's place. In this dense institutions scenario, made up of innumerable governmental organizations and non-governmental institutions, one of the greatest difficulties is mainly in delimiting the responsibility boundaries. This, in terms of the limits between the spheres of power and the predictability of these formal rules, in changing institutional informality. In any case, Brazilian environmental and mineral legislation exists, but this work presents other data that are different from what is set forth by this legislation, the domain of the Ministério do Meio Ambiente, through its organs, and the Ministério de Minas e Energia. It is also worth emphasizing the lack of openness and dialogue with civil society, for the elaboration of the country's mineral policy. That should seek development in a sustainable way. Effectively, as has been said, can be pointed out as the main threats to the environment. In the topics below, we highlight some aspects identified in this immense scenario, composed of several institutions and major environmental impacts.

Environmental impacts of mining on environmental preservation areas and indigenous areas in the Tapajós mineral province

In the historical analysis movement, one can perceive the dialectical logic. This is due to the relations that have been established between the power institutions and the development policies adopted for this Brazil region. It is also necessary to explain the contradictions of reality, from the environmental and mineral legislation point of view, which reflects in everyday practices. In 1958, the first gold deposits in the Tapajós river region were discovered. The movement intensified with the opening of the highways Transamazônica and BR-163, Cuiabá-Santarém favored the colonization program of the federal government, in the 1970s. Attracting a large flow of migrants to the region from various regions of the country in search of enrichment, due to the recent gold discovery in the region. It is also emphasized, that from the development anthropology point of view, the artisanal mining activity has, traditionally, its own model of production and social division of labor. This is considered within a capitalist exploitation model, as primitive. In this way, in "The Savage Mind", Lévi Strauss (1962) makes reference to the different ways of thinking in other possible modes of concepts and classifications. In the case of the artisanal work in mines, it showed another way of thinking about this activity. Something that had its own distinct logic, and a specific vocabulary, built from the experience sensory data. For example, in artisanal mining, the division of labor is done by the owner of the mine. This one designates a man of his confidence to receive the goods from the urban centers, to supervise people that arrive and leave, and buy the metal produced by the gold prospector, through a system called current account, that is the delivery system very common in the Amazon since the rubber exploitation. The study carried out by Posey (1987) with the Kayapó Indians includes the own forms of knowledge and classification used in the work that can be related in this sense. Specifically, from the concepts developed point of view. As an example, the expression "bamburra / bamburrar" (enriching / finding a golden lode) is presented. In contrast, there is the use of the word "blefo/blefado" (subject who has lost everything, unfortunate). Another used term is "currutela" (it is the physical base of the support of the mine, a small community with warehouse, goods sale, pensions, clubs for fun, houses with resources of forest, usually own energy

engine generated by diesel oil) and also "garimpeiro de baixão" (determined person, persistent, courageous). Finally, it is another possible way of organizing his work and his relationship with the world, to which the individual is inserted. It should be added that the technology used for manual mining is quite simple. Being used rustic instruments, like the gold panning, the pickaxe, and the shovel, supported or not by machinery moved by diesel oil. This activity differs from mining carried out by big companies, linked to the capitalist mode of production, focused on meets market demands. In this way, artisanal mining presents a set of specific rules to meet its purposes, related to the subsistence of gold production. On one side there is the investor, who proposes to defray the expenses of the initial research, and on the other, the gold prospector. The explorer. According to Lestra and Nardi (1984) there is still the ranger who, with his experience, intends to run a small group of 3, to enter the forests and watercourses, looking for gold content areas.

Over time, however, the urgency and pressure of the foreign market for a new model of ore exploration has forced gold production to reinvent itself, triggering new production processes that are more damaging to the environment. The intense extraction period was also accompanied by a disorderly population growth with people being attracted from different regions of Brazil to the Tapajós mines. And according to Soares (2012) at the peak production, in the 1980s, Tapajós mines produced 14 tons of gold per year. In this way, they lost only to another large mine of the Amazon, that was Serra Pelada. However, this panorama has changed with the entry of large mining companies in the region. Another fundamental aspect is the way in which gold is extracting, through techniques that aim to increase productivity, but cause big environmental devastation. This is because they use equipment with a great destructive force, which is the backhoe, called PC, in addition to the dredges that dig the rivers, looking for gold. (Figure 6)



Figure 6. Illegal mining activity in indigenous lands in Das Tropas river, a tributary of Tapajós river, use of machines coupled to water hoses called "Tatuzão"

It is worth mentioning that mining activities in the Tapajós mineral province are using, in addition to mercury for the purification of gold, also cyanide. In this sense, the data contained in an interview with the general supervision coordinator of IBAMA / Itaituba (2015), Jair Schmitt, were used. Although this was taken at a time when the circumstances were complex, it will be used here to reinforce the question of the lack of control in mining activity in this

region : - "Illegal mining brings great impacts to the environment by contaminating water courses with mercury and degrade the soil, destroy the vegetation, and administrative sanctions for these practices can reach R \$ 10 million reais, in addition to the goods and products involved in the infraction being seized."

The reproductive logic and its dynamics of articulation of the global economic-political system: In the Brazilian Amazon, indigenous lands correspond to 13% of the Brazilian territory and a forest area that corresponds to 60% of all the forests of the planet tropical belt. In this perspective, how is the federal government relating to this uncertain future, on the verge of a climate crisis, based on a rationality that is taking over the world?

The environmental devastation caused by the illegal mining activity can be noticed in the death of rivers, like the Krepuri river due to mineral residues contamination. They can also be observed in rivers like Cuiu-Cuiu and significantly in Das Tropas river, and the stream Massaranduba that they unravel in the right riverbank of Tapajos river. (Figure 7 and Figure 8)



Figure 7. Massaranduba river contaminated by garbage wastes



Figure 8. Aerial view of Crepori River dewatering into the Tapajós River

In general, the impacts also occurred with the indigenous populations, according to FUNAI, regarding the contamination. In 1999 a multidisciplinary team from the University of Brasilia (UnB) conducted a study to measure the degree of mercury contamination in Indians and fish. In that way, different degrees of contamination were found in the villages. Overall, the Munduruku indigenous people still face

serious problems regarding the illegal exploitation of gold within their territory. This is because mines attract the interest of mining companies and gold prospector groups. In addition, the gold exploration in other areas of the reserve still persists. This is the Teles Pires river case, in front of the village of the same name, on the Cabitutu river, Cadiriri river (BIERI, 2015 nc), of Das Tropas river where the gold mining barges are constant, and gold prospectors have permanent contact with the Indians. However, the social climate between indigenous people and gold prospectors worsened in early 2018. On January 17, 2018, a letter was sent to the Federal Public Ministry and Funai by the Ipere Gayu Indigenous Movement. In the letter, the indigenous people communicate to the governmental entities that the Munduruku PV Village was totally decimated by the mine. The text below is a fragment of the letter that emphatically denounces that the "Large mine ":

...

"It killed the forest and the fields, took disease, prostitution, alcoholic beverages consumption among men and women and introduced drugs among teenagers."

Also according to the Charter, the mine is controlled by non-indigenous "pariwat" who lure the Indians with "gifts" such as flying, engines, food, and money. At the Indigenous Assemblies held in 2017, specifically in March 2017 Assembly in the Sai Cinza Village (Bieri, 2017 nc), it was agreed by all the leaders that all mining in indigenous lands should be closed. Once again the communiqué of this meeting was sent through a document signed by the tribal chief and leaders and sent to Funai, ICMBIO and the Federal Public Ministry. However, despite all the protocol procedure, none decision was made and the gold prospectors increasingly expanded their fields of action. Nowadays, along with some indigenous people who work in the mine, they threaten to enter with all the machinery to other regions inside the Munduruku territory, in the rivers Cadiriri, Cururu and Cabitutu opening new fronts of mining. Generally, the ambiguities and inattentions of public policies in the Tapajós region do not prevent some experiences from further disappointing the disadvantaged social people such as happened after a disastrous police action in 2010 in the Teles Pires village. Conflicts generated from illegal mining in the Munduruku indigenous land that triggered a chain of events. In testimony, the natives noticed that the federal agents practiced several atrocities, including using the helicopter that flew over the village Teles Pires, to shoot bombs. The action was confirmed through videos made by mobile phones, the indigenous, and the images were sent to various regions of the world and can be accessed on the Internet. On land, according to information from the indigenous people of the Teles Pires village (BIERI, n.c., 2012), the officers practiced beatings on elderly people, women, and men. In addition, they carried out the destruction of public patrimonies, such as school, health clinic, and Indian homes, as well as radiophonic apparatus, energy engines, and other material goods. Due to the increasing pressure and violence of the agents, the indigenous Adenilson Kirixi Munduruku reacted, but was murdered by the federal agents. This fact caused an uprising in the Munduruku people and had great repercussion, both national and international media. In this diversities context, from 2010 the conflicts and clashes between the Munduruku people and the federal government were intensified, through resistance to the hydroelectric complexes construction of Tapajós basin. However, with the approval of ANEEL's dispatch on 1.887 in May, 2009,

according to data from Ecology Brasil (2014), the construction of seven hydroelectric plants (UHE) stands out. Of these, three are in the Tapajós river and four in the Jamanxim river.

Through the Interministerial Ordinance No. 419/2011, in 2011, FUNAI clarified the conditions and requirements that must be contained in the Study of the Indigenous Component. In this document, she informs that the foreseen area for the project and its reservoir overlap the Andirá-Marau, Km 43, São Luiz do Tapajós, Praia do Índio, Mangue, Pimental and São Luiz do Tapajós indigenous lands. According to the Federal Public Ministry (2014), this ordinance also states that the Pimental indigenous lands, Km 43 and São Luiz do Tapajós are under demarcation. In this sense, based on the Relatório Circunstanciado (Detailed Report) on the Identification and Delimitation of the Sawré Muybu Indigenous Land (RCID / 2013 p.129), 7% of this territory will be flooded by the UHE São Luiz do Tapajós reservoir. From the legislation point of view, Article 231 of the Federal Constitution, which deals with indigenous rights, precludes to remove the Indians from their villages. Therefore, according to the legislation, the hypothesis of the interruption of the São Luiz do Tapajós hydroelectric construction would not be ruled out. In order to better understand the impacts related to the mega power generation project construction in the Tapajós basin, it should be highlighted that the area to be flooded is equivalent to 200.000 hectares. These involve a complex mosaic of conservation units, encompassing the Amazon National Park, indigenous lands, coastal communities, colonization areas and public lands that are in the land regulation process. In this analysis, as an example, near the village Sawré Muybu there are several mines and ferryboats. And, several roads are within these protected areas, which are considered as forest areas with a high biodiversity degree. It should also be said that the area occupied by diamond mining, called Chapéu do Sol, was part of the Itaituba II National Forest. This one was resized by means of Decree 2.678 / 2012, for being on the construction's route of the São Luiz do Tapajós hydroelectric plant reservoir. Thus, as Silva (2010) classifies, the natural development and the predatory instinct occasioned by modern capitalism turn increasingly to exploitation interested only in the maximization of results. Thus, the possibility of the hydroelectric complexes construction in Tapajós and Jamanxim river basins, as well as the BR-163 asphaltting, aroused the interest of large mining projects. Thus, at least one medium-sized company has already settled in the region, with the Tocantinzinho Project, which in July 2015 completed its feasibility study.

This study, according to Eldorado Gold (2012), which is a subsidiary of Canadian Brazauro Resources Corporation, was conducted by an internal team with technical support from Brazilian and Canadian consultants. In terms of the project, it should come into operation in 2016. From this perspective, it is worth mentioning that the consultants in these processes are, in fact, the drivers that represent the interests of their customers, the big companies. Thus, it should be noted that the Tocantinzinho Project is linked to the Eldorado Corporation, associated to a large Canadian mining company, which has mining projects in several countries around the world, such as China, Turkey, Greece and now in the gold province of Tapajós. The access of Tocantinzinho Mine takes place through the Moraes de Almeida district. This is in Itaituba city and has an extension of 102 km. Initial investments, according to Eldorado Corporation (2012), are in order of US \$ 16

million. Is currently seen in the Amazon region, especially in the gold-producing province of Tapajós-Pará, that the logic of ventures receives operating licenses from government institutions to serve the global market interests. Before they even started their bureaucratic procedures, ecological and environmental logics were left out of profit accounting. In any case, regarding to the Jamanxim National Forest, ICMbio (2010) clarifies that it is a conservation unit with an area of 1.3 million hectares, where environments with a good level of integrity predominate. It means that this forest area is still in perfect harmony in relation to the forest and atmosphere, contributing to the CO₂ and water vapors production. Considering that a large grown tree throws in the atmosphere 1000 liters of water per day (Nobre, 2011) in a frenetic evaporation activity. Consequently, this forest region has a high biological relevance, with extraordinary sophistication through trees transpiration in the form of flying rivers through sunlight expose. These data are impressive and the region stands out equally for both the scenic beauty and the diversity of fauna and flora species.

Final considerations

In contemporary society, based on the economic policies logic to meet the global capitalist market demands. Therefore, there is the distancing of ecological logic related to nature preservation. This implies in the constant use of natural resources, with the environment irrational exploitation. Thus, increased consumerism, with consumer goods accumulation, the capitalist mode of production causes serious damage to the environment as the destruction of ecosystems, the genocide of indigenous peoples and traditional populations. Nevertheless, the purpose of this work was to show the reproductive logic of the dynamics articulation in the scope of the formal rules operationalization, by the governmental institutions, in the gold province of Tapajós. The action scope of these projects encompassing conservation areas and indigenous lands that require greater action from government agencies. Since the mining was discovered in 1950 the Tapajós region was treated as an exploration platform, peaked in the 1980s and guided the regional economy by moving resources on a large scale. The impact of this strategy is clearly the social imbalance of the municipalities surrounding the other cities of the Pará State that reproduce the same social problems of poverty and inequality. Currently, this type of economy returns to the scene, with private sector investments, as a new economic cycle due to the reduction of forest areas, by Presidential Provisional Measure MP 558/05, January 2012. Thus, this is one of the main factors that entail to an increase in the flow of investments in mineral activities in the Itaituba II Forest and in the Amazon National Park, as well as in the conservation units, among them the Amazon National Park. There were also changes in other areas limits of environmental protection, such as the Itaituba II Forest, through Decree 2.678 / 2012. These areas were reduced in order to make feasible the reservoir's construction of the São Luiz do Tapajós hydroelectric power plants and Jatobá, and stimulated the increase of illegal mining activities in this territory, including in indigenous lands. Regarding to the valorization of elitist heterodoxies, the elaboration of a developmental proposal, since the implementation of works such as the São Luiz do Tapajós and Jatobá hydroelectric complex has created expectations of generating synergies. In this way, the idea of development and wealth guides discussions in cities like Itaituba, Trairão, Jacareacanga, Novo Progresso and other municipal districts.

However, these expectations of economic synergies are pertinent questions, and it is not observed efforts in these municipalities to meet the demand of the local population with services and food production. In the field research (Bieri, 2017, 2018) it was observed that vegetables, eggs, rice, chicken, and all kinds of food are transported by larger urban poles such as Itaituba using a plane to the mining areas. The production of food from the incentive to family agriculture could be an alternative to generating employment and income in the municipalities, as well as the multiple uses of terrestrial and aquatic biomass (Mitschen, 2013) is able to make the most of the inputs in the productive process on a smaller scale because there is a socio-economic base with demand to consume these products. One of the main aspects considered is the absence of the government in the region, the absence of public development policies, considering that the authorities have the fundamental role to ensure and leverage this development. Some measures have been taken to contain the expansion of the mines, but, the effects were short-term, as the action of IBAMA and ICMbio, in the destruction of the ferries and mining equipment in the Jamanxim river. However, it must be emphasized that nothing was done in the forest areas, which are no longer part of the environmental protection reserves. In general, it would be the government institutions responsibility to apply the Lei de Responsabilidade Social (Social Responsibility Law) to these companies in order to ensure that environmental damages are repaired.

It is necessary to emphasize, the contamination of the rivers with the mining residues to the destruction of primary forest area. The massive destruction of natural resources being overlooked by federal, state and municipal public administration bodies that do not know how to seize this potential. This is justified by the fact that they are absent in mitigation processes and in the search for alternative scenarios with local development models, according to reality. And, to charge companies the onlending responsibility, for damages caused to the environment. Finally, it will be necessary to advance research, looking for new forms of development and social responsibilities, in order to give possible alternatives for economic development, which could place the Amazon in the world ranking, not as a commodities exporter, but in an equally way and sustainable.

REFERENCES

- ABREU, Maria Jasylene Pena de. Reserva da Biosfera da Amazônia Central, Brasil. In: BERNARD, Deryck; ARAGON, Luis E.; CLÜSENER-GODT, Miguel (org.). Biosphere Reserves in the Amazon. Belém: NAEA, 2007. page 111-138.
- BARROS, Carlos Juliano. Tapajós e os problemas com garimpo e agronegócio. Blog Luis Nassif. 24.12.2012. Available in: <http://jornalggm.com.br/blog/luisnassif/tapajos-e-os-problemas-com-garimpo-e-agronegocio>. Access in: October 13, 2015.
- BARQUERO, A. V. Desenvolvimento endógeno em tempos de globalização. Porto Alegre: Fundação de Economia e Estatística, 2001. 280p.
- BECKER, Berta. Amazônia: Geopolítica na virada do III Milênio. Garamond, 2004.
- BEZERRA, Oswaldo; VERISSIMO, Adalberto; UHL, Christopher. Impactos da garimpagem de ouro na Amazônia Oriental. Série Amazônia II. Belém: IMAZON, 1998.

- BIERI, Márcia. Educação Diferenciada, políticas públicas e cidadania na terra indígena Munduruku- Pará. Belém. UFPA/NAEA. Thesis, 2004.
- _____. Marcia. Fieldnotes, july/september, 2010.
- _____. Márcia. Fieldnotes, september, 2016.
- _____. Márcia. Fieldnotes, march, 2017.
- _____. Márcia. Fieldnotes, october/november, 2018.
- BRASIL. Ministério de Minas e Energia. Legislação Mineral. PORMIN. Available in: www.redeaplmineral.org.br/pormin/noticias/legislacao_mineral_resumida.pdf. Access in: October 10, 2015.
- _____. Portaria Interministerial de Criação da Reserva Garimpeira do Tapajós nº 882/83 de 25 de julho de 1983. Diário Oficial da União, Brasília, 1983.
- BRITO, Magda Taynara Abrão de; SILVA, Rayssa Bezerra; PENA, Heriberto Wagner Amanajás. Análise da dinâmica de estrutura produtiva do município de Itaituba, Pará- Amazônia- Brasil. Universidade do Estado do Pará/ Observatório de la Economia Latino Americana/ Revista Acadêmica de Economia. 2010. Available in: www.eumed.net/coursecon.ecolat/br/14/economia_itaituba.html
- BOMFIM, L.F.C. Garimpos de ouro no médio Tapajós. Belém, DNPM 5º Distrito. 1969. 10p
- CAMILO, Márcio. Liderança fala sobre participação dos índios em garimpos. Amazônia Real. 21/12/2018. Available in: <http://amazoniareal.com.br>. Access in: April 3, 2019.
- COSTA, F. de A. (original). Teorias do desenvolvimento e estratégias do desenvolvimento sustentável. (Texto didático para o PPGDSTU/NAEA/UFPA). Belém, june, 2006.
- COUDREAU, H.A. Voyage au Tapajoz. Paris. A.Lahure, 1897. 215p il.mapa
- COUTINHO, Maria Glícia da Nóbrega. A província mineral do Tapajós: geologia, metalogenia e mapa previsional para ouro em SIG: textos, mapas e SIG. Brasília: CPRM/DNPM/ Secretaria de Geologia, mineração e transformação mineral/ Ministério das Minas e Energias, august, 2008.
- ELDORADO GOLD. Geologia, desenvolvimento e viabilidade econômica do Projeto Tocantinzinho. (Província Aurífera do Tapajós). Available in: www.adimb.com.br/simexmin.2012/wp_content/themes/simexmin/palestras/07/tapajos_xingu/vi_5_hippertt.pdf. Access in: November 10, 2015.
- ELSTER, J. The case Methodological Individualism. Theory and Society, v. 11, n. 4, p. 453-483, 1982.
- FARIAS, Carlos Eugênio Gomes. Relatório para o CGEE/PNUD. October/2002.
- FIALHO, Ricardo. Garimpos: SEMA/PA estabelece normas para licenciamento de lavra garimpeira de ouro. Blog Mineração na Amazônia. Available in: <http://mineracaonaamazonia.blogspot.com.br/2013/07/sem-a-estabelece-normas-para-licenciamento-de-garimpos-nopara.html>. Julho/2013. Access in: November 10, 2015.
- _____. Política mineral: Pará estuda cadeia mineral. Available in: <http://mineracaoamazonia.blogspot.com.br>. Access in: November 10, 2015.
- FUNAI. Relatório Circunstanciado de Identificação e Delimitação da Terra Indígena Sawré Muybu (Pimental) PA. Brasília, set. 2013. Available in: [http://www.cimi.org.br/file_RCDIDSawreMuybu\(pimental\)2013_2pdf](http://www.cimi.org.br/file_RCDIDSawreMuybu(pimental)2013_2pdf). Access in: March 14, 2015.
- _____. FUNAI. Informação Indígena Básica, n. 47/82. AGESP/FUNAI, 1982.
- GONÇALVES, Emanuel Vieira; LIRA, Daniel Ferreira de. O licenciamento ambiental nas atividades de mineração. Âmbito Jurídico. Available in: www.ambitojuridico.com.br/site/?n_link=revista_artigos_leituras&artigos_id=12009. Access in: October 29, 2015.
- GOVERNO DO ESTADO DO PARÁ. Estatística municipal de Jacareacanga. Belém: SEPOF -IDESP 2011. Available in: <http://ich.iec.pa.gov.br> Access in: April 3, 2019.
- INTERNATIONAL ASSOCIATION FOR IMPACT ASSESSMENT (IAIA). Avaliação de impactos sociais. Edições Especiais n. 2, mar. 2003.
- INSTITUTO CHICO MENDES DE CONSERVAÇÃO DA BIODIVERSIDADE (ICMbio). Plano de manejo florestal do Jamanxim localizada do estado do Pará. Curitiba, 2010. (Volume I- Informações gerais)
- LEANDRO, P. Garimpos do rio Tapajós. Belém, DNPM- 5º Distrito 1969. 23 p. mapa/AT-DGM-m°2059.
- LÉVI-STRAUSS. A ciência do Concreto. In: LÉVI-STRAUSS. O pensamento Selvagem. São Paulo: Comp. Ed. Nacional, 1976. P. 19-55.
- MARX, Karl; ENGELS, Friedrich. Manifesto do Partido Comunista. 9. ed. Petrópolis-RJ: Vozes, 1999.
- MATHIS, Armin. Garimpagem de ouro na Amazônia. In: XIMENES, Tereza (Org.). Perspectivas do desenvolvimento sustentável: uma contribuição para Amazônia 21. Belém: NAEA/UFPA, 1997. p. 391- 406.
- MITSCHEN, Thomas A.; ROCHA, Gilberto de Miranda; SOBRINHO, Mário Vasconcelos. Desenvolvimento Local e o Direito à Cidade na Floresta Amazônica. Belém: NUMA/UFPA, 2013.
- MONTEIRO, Telma. Complexo do Tapajós estaria no maior distrito aurífero do mundo. Blog Telma Monteiro. Available in: www.telmadmonteiro.blogspot.com.br. Access in: August, 2011.
- NOBRE, Antônio Donato. TED X AMAZÔNIA (vídeo). Publicado em 15 de março de 2011. Available in: <http://m.youtube.com/watch>. Access in: March 8, 2019.
- PARENTE, J. Garimpagem com dragas avança no rio Tapajós. June 6, 2015. Available in: www.jotaparente.blogspot.com Access in: December 10, 2015.
- POSEY, Darrell Addison; FRECHIONE, John; COIROLO, Alicia Duran. The perception of ecological zone and natural resources in the Brazilian Amazon: an ethnoecology of lake Coari. In: POSEY, D. A.; BALÉE, W. (eds). Amazonia: indigenous and folk strategies. New York: NY Botanical Garden, 1989. p. 260-282.
- RIVERA, Jose. In: NAÇÕES UNIDAS BRASIL-ONU/BR. Especial: Os desafios legais para acolher e proteger os migrantes afetados pelas mudanças climáticas. 2014. Available in: <http://nacoesunidas.org/especial-os-desafios-para-os-refugiados-cansados-pela-mudanca-climatica>. Access in: 30 out. 2015.
- RODRIGUES, Rita Maria; MASCARENHAS, Artur F.S; ICHIHARA, Ambrósio Hajime; SOUZA, Terezinha Maria Cid; BIDONE, Edson Dausacker; BELLIA, Victor; HAGON, Sandra; SILVA, Alberto Rogério B. da; BRAGA, João Bosco P.; STILIANDI FILHO, Bernard. Estudo dos impactos ambientais decorrentes do extrativismo mineral e poluição mercurial no Tapajós - pré-diagnóstico. Rio de Janeiro: CETEM/CNPQ, 1994. Available in: <http://www.cetem.gov.br/>

- publicacoes/serie_sta/sta_04pdf. Access in: October 24, 2015.
- SIMONIAN, L. T. L. Pesquisa em ciências humanas e desenvolvimento entre as populações tradicionais amazônicas. Boletim do Museu Paraense Emílio Goeldi, Belém, v. 1, n. 2, p. 119-134, 2005.
- SOARES, Antônio José. Itaituba perde maior mineradora. Jornal Diário do Pará, Belém, 2012. Available in: www.inda.org.br/exibe.clip.php?perfil=2147. Access in: October 13, 2015.
- TERRA DE DIREITOS.Ficha Técnica: Complexo hidrelétrico na bacia do rio Tapajós. Março/2014.Available in: <[http://www.territoriodedireitos.org.br/2014/03/03/ficha técnica](http://www.territoriodedireitos.org.br/2014/03/03/ficha_tecnica)> Access in: May 21, 2014.
